

No. 8.— *Howler Monkeys of the palliata Group*

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INTRODUCTION

Last winter the Museum of Comparative Zoölogy received several specimens of a howler monkey from Herrera Province in Panama, that could not be satisfactorily identified until there had been a general revision of the group as a whole. The available material was, therefore, assembled from all of the larger museums in the country and a careful study made of a series of skins and skulls numbering some 174 specimens. Shade and distribution of color, length and texture of the hair, and size were carefully noted in all of the individuals observed. Skull measurements were taken, checked, and then reduced to ratios using the total length as a common dividend. This was done in order to make the measurements comparable regardless of size differences due to age. Deformed and badly broken skulls were, of course, not used. It became apparent as soon as work was started on this group that the range of individual variation is exceedingly great; coupled with this there is a marked similarity among individuals taken at the same time in the same place and so, presumably, out of the same band. Dr. Ray Carpenter, who has spent considerable time in Panama studying the habits of these monkeys, writes me that from actual field observations he, also, has found this to be true. Further, he says that although howler bands are not closed societies, "females and to a high degree males of a group remain in rather constant association"; solitary males may break off and later join with some other band, bringing about interbreeding between troops without, however, obviating the fact that there is a certain common genetic background for individuals of each band. This, I believe, is particularly important from a taxonomic standpoint; great care must be exercised not to give undue weight to traits that are merely local family differences, for this would lead to a ridiculous and wholly unwarranted number of subspecies each limited to a very small area. The problem is further complicated by the appearance of occasional individuals in almost every part of the total range that differ from their nearer representatives but are very similar to others found at some point far removed geographically. Only when the extremes of each area are very different and the average form is quite distinct have I considered it justifiable to subdivide the typical form. Unless each small local race is given separate recognition, this is the only practical method of dealing with the group. External measurements of fresh specimens were not available in all cases, and where they could be obtained were not

strictly comparable as they were taken by a number of different people. Although I have used these to a certain extent as an index of size, I have emphasized more especially differences in skull size. The manner in which cranial measurements were taken is explained in detail below. Names of colors in quotation marks are always after Ridgway, "Nomenclature of Color for Naturalists," 1886.

I have made no attempt to deal with the habits and life history of these monkeys, as Dr. Carpenter is preparing a very comprehensive study of this field. The distribution of the species as a whole is very widespread in the forested areas extending from the southern part of the state of Vera Cruz in Mexico into Ecuador. The most southerly example that I have examined comes from El Chiral south of the Gulf of Guayaquil. Detailed distribution I have considered separately for each subspecies. The range in altitude at which they may be found is governed principally by the occurrence of suitable forest growth.

ACKNOWLEDGMENTS

I am very much indebted to Dr. Wilfred H. Osgood, Curator of Mammals, Field Museum of Natural History, to Mr. G. S. Miller, Jr., Curator of Mammals, Smithsonian Institution, United States National Museum, to Dr. L. R. Dice, Curator of Mammals, Museum of Zoölogy, University of Michigan, to Dr. H. H. T. Jackson of the U. S. Biological Survey, for the kind loan of much important material, and to Mr. H. E. Anthony, Curator of Mammals, and Mr. G. H. H. Tate, Assistant Curator of South American Mammals, American Museum of Natural History, for a similar loan and for other courtesies. I also wish to thank Dr. Thomas Barbour, Director of the Museum of Comparative Zoölogy, through whose efforts an excellent series of Herrera and Canal Zone monkeys was obtained; Dr. G. M. Allen, Curator of Mammals, Museum of Comparative Zoölogy, without whose assistance and advice I should not have been able to prepare this paper; and Dr. Ray Carpenter who has very kindly supplemented my material with some of his own personal field notes on the habits, distribution and coloring of these monkeys.

Explanation of cranial measurements

In studying the skulls of this species the following measurements were taken in millimeters:

Greatest length.—Length from the occipital projection to henselion, the most anterior point of the palate at the inner base of the incisors.

Condyllo-basilar length.—Length from condylion, the most posterior point on the occipital condyle, to henselion.

Basilar length.—Length from basion, the most anterior point of the foramen magnum, to henselion.

Palatal length.—Length from palation, the most anterior lateral point on the posterior margin of the palate, to henselion.

Length of rostrum.—Minimum length from the lower border of the orbit to gnathion.

Zygomatic width.—Maximum width across the zygomatic arches.

Mastoid width.—Width across the mastoid bones directly above the center of the auditory meatus.

Width of braincase.—Maximum width across the braincase.

Width outside molars.—Maximum width of the molar series taken across the crowns.

Upper cheek teeth.—Total length of the upper cheek teeth from the most anterior point on the canines to the posterior border of the third molar.

Lower cheek teeth.—Total length of the lower cheek teeth from the most anterior point on the canines to the posterior border of the third molar.

Length of first premolar.—Maximum length of the first premolar taken antero-posteriorly on the outer margin of the tooth.

Width of first premolar.—Maximum width of the first premolar taken across the crown.

As many of the skulls examined had lost their incisors, all of the total length measurements were taken exclusive of these teeth. Unless otherwise stated all measurements not in the mid-line were taken on the left side of the skull. A full table of the measurements, grouped according to localities may be found on the last pages of the paper. As explained above, all of the measurements were reduced to ratios, using the total length as a common dividend; the more significant of these together with the average for each group are inserted immediately following the description of each subspecies. Certain traits that are not very readily demonstrable by measurements as skull ridges, the shape of the audital bullae, the shape of the interpterygoid fossa, and the position of the hamular processes of the pterygoids have been noted separately.

ALOUATTA PALLIATA PALLIATA (Gray)

Myctes palliatus Gray, Proc. Zoöl. Soc. London, 1848, p. 138, pl. 6; Wagner, Schreber, Säugeth., Suppl., 5, 1855, p. 71; Reichenbach, Vollstand. Naturg. d.

Affen, 1862, p. 70; Frantzius, Archiv f. Naturg., **35**, 1869, p. 254; Gray, Cat. Monkeys, Lemurs and Fruit-eating Bats, Brit. Mus., 1870, p. 40; Selater, Proc. Zoöl. Soc. London, 1872, p. 7; Schlegel, Mus. des Pays-Bas (Leyden Museum), Simiae, 1876, p. 152; Alston, Biol. Centr.-Amer., **1**, Mamm., 1879, p. 4; True, Proc. U. S. Nat. Mus., **7**, 1884 [1885], p. 611; Forbes, Handbook Primates, **1**, 1894, p. 202.

Alouata palliata Trouessart, Catal. Mamm. viv. foss., 1897, p. 34.

Alouatta palliata Elliot, Publ. Field Columb. Mus., Zoöl. Ser., **4**, Pt. 2, 1904, p. 726, fig. 138; Id. Publ. Field Columb. Mus., Zoöl. Ser., **6**, 1905, p. 533; Id. Publ. Field Columb. Mus., Zoöl. Ser., **8**, 1906, p. 555, pl. 81; Elliot, Mon. Ser. Am. Mus. Nat. Hist., **1**, 1912 [1913], p. 271.

Alouatta palliata matagalpae Allen, Bull. Am. Mus. Nat. Hist., **24**, 1908, p. 670.

Type specimen. Originally described by Gray from a specimen sent to him by Sallé, supposedly from Caracas, Venezuela. Sallé later stated to Selater that he had procured the specimen on the shores of Lake Nicaragua, so this becomes the type locality, and *Alouatta palliata matagalpae* a synonym. The type as described by Gray probably has a greater proportion of light-colored hairs on the sides than is average for the typical subspecies. No cranial measurements are given.

Description. Size large, general color black with light flank hairs, face black and naked with a pronounced beard in the males. Skull short, broad; braincase flattened, hardly projecting above the level of the orbits; angle of the mandibles tremendously enlarged.

The color of these howler monkeys is extremely varied. Typically they are quite dark with the head, shoulders, and limbs almost black; in certain lights they take on a slight brownish tinge. The flank hairs are "cinnamon-rufous," with the bases only slightly paler and the tips dark "walnut." These flank hairs extend from the groin to the armpit and are most pronounced posteriorly. In the lower dorsal region they mingle gradually with a few light-banded hairs; these are not very numerous, have "walnut" bases, dark tips, and a narrow band of "cinnamon-rufous" immediately below the tip. A few of them may be scattered along the sides well anteriorly but the central dorsal region is usually quite free of them. Variation from this coloring is somewhat extreme in both directions. I have one individual from Costa Rica that is entirely black and another from Coto in Panama that has the head, shoulders, limbs and tail very dark "walnut" to black, the flanks with a mantle of bright, golden "orange rufous," the bases of the hairs silvery "buff yellow," and the tips "walnut" of a not very intense shade. These flank hairs extend in a wide fringe from the groin to the armpit.

The lower part of the back is covered with hairs tipped with dark "cinnamon rufous," the bases of these hairs are buffy and there is a narrow strip of dark "walnut" just above the base; about half way up the back the bases of the hairs become pale "walnut," and the tips darker until there is only a very small ring of "cinnamon" or "orange rufous" left. These hairs mingle gradually with those that are completely dark until on the fore part of the back and the shoulders there are no light-banded hairs at all. On the inner margin of the hind legs there is a very slight tinge of dark "cinnamon rufous." Although this is the most brilliant example of *A. p. palliata* that I have examined, the type and a topotype of J. A. Allen's *A. p. matagalpae* are almost as bright with the rump only slightly darker and the extent of the mantle somewhat reduced. Some of *A. p. palliata*, again, have the mantle silvery "chrome yellow" without any appreciable red pigment, others, over the whole back, have the bases of the hair very pale with the dark tips just long enough to give the animal a black appearance. This occurs generally where the light mantle is reduced.

Skull. Members of this group have a short, broad, and somewhat massive skull. The zygomatic arches are short and rather squarely spreading, ending posteriorly in a pronounced ridge over the auditory meatus. The brow ridges, the temporal ridges, and the ridge along the occipital suture are all prominent. The braincase is short and broad, generally slightly depressed between the orbits, and flares somewhat posteriorly from a marked constriction in the temporal region. There is generally a definite angle where the frontal profile rises from the rostrum which is moderately long in proportion to the braincase. The nasal bones are narrow and slightly flaring anteriorly. The interorbital space is narrowest across the upper portion of the inner margin of the orbits on a line about parallel with nasion. The audital bullae are rounded, and only moderately bulging. The sides of the interpterygoid fossa are rounded and approach each other most closely at the extreme posterior end. The palate is U-shaped, and in general parallel-sided. Proportionally the molars are large, while the premolars, especially the first, are considerably smaller. In the male, particularly, the canines are enlarged, the lower incisors are vertical and the upper ones are proclivous. Males also have the tremendously enlarged angle of the mandible to protect the large hyoid bones, typical of the genus. Skulls of the females are very easily distinguished from those of the males by the absence of this feature. They are smaller and lighter with none of the ridges so pronounced as in the male.

Remarks. Although this monkey appears very early in the literature

of Central American mammals, no extensive analysis of its distinguishing traits and of its range seems to be available. The original description of *Myectes palliatus*, containing no mention of skull features, is as follows: "Black brown; hair of the middle of the back and upper part of the sides yellow brown, with black tips; of the lower part of the sides elongate brownish yellow forming a kind of mantle on each side" (Gray, 1848). Dr. von Frantzius in 1869 compares certain individuals that he collected in Costa Rica with Gray's description of *Myectes palliatus*, and states that the Costa Rican form is "black" rather than "black brown" of Gray, that the golden hairs are found only on the undersides and the shoulders, and that the coloring of the male, female and young is very similar. In spite of the color differences between his animals and Gray's, however, he agrees with Peters in calling his specimens *palliatus*. The earliest reference that I have been able to find to the error made in the type locality of this form is in Sclater's paper in 1861: "a *Myectes* described and figured by Dr. Gray in the Proceedings of the Zoölogical Society for 1848 under the name *M. palliatus*, and erroneously stated to be from Caraccas." Later, in 1872, he explains that M. Sallé, who procured the type and some other specimens, told him that they came from Nicaragua where they occur on the islands and banks of the lake. The correction in type locality is on good evidence, and I believe should be allowed to stand. The possibility of a very wide range in color variation was first noted by Schlegel in 1876: "Je ne crois pas qu'il existe des différences constantes dans les teintes de l'espèce, suivant les localités." Although he recognizes that von Frantzius' monkeys from Costa Rica might be darker than Gray's type, he claims that the wide range of color variation in the seven Panama examples that he personally examined bears out his theory that these differences are merely individual traits. It is very likely that the specimens which he actually studied were *A. p. aequatorialis*, nevertheless his conclusions in this matter are probably quite accurate and equally applicable to both forms. Alston in 1879, summing up the work done on *Myectes palliatus*, states that some of the Panama howler monkeys are as dark as the Costa Rican ones while some are as light as the Nicaraguan type and concludes: "I must therefore agree in Prof. Schlegel's conclusion that the variation does not depend on locality." The synonymy of this form includes *A. p. matagalpae* J. A. Allen, which was described in 1908 from two specimens collected in 1907 at Savalá, Matagalpa, Nicaragua. When Allen named this form, he was unaware of the true type locality of *A. p. palliata*. He characterized it as being similar in size to *A. p. palliata*.

and *A. p. mexicana*, and as having flank stripes "dark rufous instead of pale rufous or golden (*palliata*) or pale fulvous or grayish fulvous (*mexicana*); suffusion of back dark rufous instead of fulvous or grayish fulvous." On recognition of Nicaragua instead of Caracas as the type locality for *A. p. palliata*, it becomes clear that *A. p. matagalpae* is identical with Gray's animal.

The subspecific division of *Alouatta palliata* has been difficult; for aside from a few very marked forms, as the one from Coiba Island and the two from Guatemala, individual differences in a given area have been so numerous as almost to coincide with the variation over the total range of this species. *A. p. mexicana* may be distinguished principally on the basis of certain skull characters; the three remaining forms are, however, dependent more especially on differences in shade and distribution of color. It has been most difficult to separate *A. p. aequatorialis* from typical *A. p. palliata*, because in the region of Panama there is so much intergradation between the two forms. Though very similar individuals with much reduced light markings are occasionally found over most of the range of the species, the extremes of variation are totally different. This is particularly interesting, as these extremes are not isolated forms but individuals from a series in which there may be all degrees of coloration leading up to the extreme form. I have described in detail the pigmentation of the brightest individuals of *A. p. palliata* and this may be compared with the much yellower Ecuadorean extreme, where the whole general ground color is markedly browner and the "ochraceous" coloring of the flanks extends far down on to the hind limbs. In general the even ticking of light-banded hairs over the back without such a marked concentration in the posterior region, the absence of any "orange rufous," and the presence of a few light hairs scattered over the tail, very often concentrated at the tip, are quite characteristic of *A. p. aequatorialis*. Further, the rostrum is slightly shorter and the occipital projection somewhat more pronounced.

Geographical distribution. The typical form of *A. p. palliata* is found from the extreme western part of Panama north through Costa Rica, Nicaragua, and Honduras. In the south it merges gradually with *A. p. aequatorialis*, making the individuals from Panama quite intermediate. The most northern specimens that I have examined come from Honduras near the Guatemalan border and are typical *A. p. palliata*; intergradation between these and the Mexican and black Guatemalan forms probably takes place farther north.

Specimens examined. In all, 46, as follows:

Panama, Coto, one female, skin and skull;

Costa Rica, Talamanca, eight males, three skin and skull, two skin only, three skull only, eleven females, two skin and skull, one skin only, eight skull only; Guayabo, two females, skin and skull; no locality, three males, two skin and skull, one skull only, three females, skull only;

Nicaragua, Matagalpa, five males, skin and skull (including type of *matagalpae*); Peña Blanca, one male, skin and skull;

Honduras, Chamelicon, one male, skin only; Segovia R. one male, skin only, one female, skin only; eastern part, one male, skull only, three females, skull only; San Pedro, one male, skin and skull, one female, skin and skull.

Skull ratios					
<i>Male</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.73-3.00	2.84
"	"	"	" length of upper cheek		
			teeth	2.60-2.84	2.69
"	"	"	" length of rostrum	3.17-3.45	3.29
"	"	"	" zygomatic width	1.32-1.46	1.39
"	"	"	" mastoid width	1.91-2.11	2.00
"	"	"	" width outside molars	2.68-3.09	2.87
"	"	"	" width of cranium	2.02-2.25	2.15
<i>Female</i>					
"	"	"	" palatal length	2.73-3.03	2.84
"	"	"	" length of upper cheek		
			teeth	2.55-2.81	2.68
"	"	"	" length of rostrum	3.33-3.67	3.46
"	"	"	" zygomatic width	1.39-1.52	1.45
"	"	"	" mastoid width	1.93-2.08	2.01
"	"	"	" width outside molars	2.73-3.00	2.87
"	"	"	" width of cranium	1.97-2.21	2.10

ALOUATTA PALLIATA AEQUATORIALIS Festa

Alouata aequatorialis Festa, Boll. Mus. di Zoöl. ed Anat. Comp. d. Univ. d. Torino, 18, 11 Feb. 1903, p. 3. Elliot, Mon. Ser. Am. Mus. Nat. Hist., 1, 1912 [1913], p. 274.

Alouatta palliata Slack, Proc. Acad. Nat. Sci. Phila. 1862, p. 519.

Mycetes niger Thomas, Proc. Zoöl. Soc. London, 1880, p. 394.

Mycetes palliatus Anderson, Cat. Mamm. Ind. Mus., Calcutta, Pt. 1, 1881, p. 83.

Alouatta palliata Allen, Bull. Am. Mus. Nat. Hist., **20**, 1904, p. 79; Elliot, Publ. Field Columb. Mus., Zoöl. Ser., **8**, 1907, p. 555, pl. 81.

Alouatta inclamax Thomas, Ann. Mag. Nat. Hist., Ser. 8, **12**, Dec. 1913, p. 567.

Alouatta palliata quichua Thomas, Ann. Mag. Nat. Hist., Ser. 8, **12**, Dec. 1913, p. 567.

Alouatta palliata inconsonans Goldman, Smithsonian Miscell. Coll., **60**, Feb. 28, 1913, p. 17; Ibid., **69**, 1920, p. 229.

Type specimen. Described from four cotypes, two adult males, one female and one young, skins numbers 101, 102, 103, and 104, and skulls numbers 4688, 4886, 4692, and 4693, Mus. di Zoölogia ed Anat. Comparata della Università di Torino, from Vinces, Ecuador; collected in September, sometime between 1895 and 1898, by Enrico Festa. *Alouata aequatorialis* was suggested by Festa for his four specimens in the event that they should prove distinct from *Alouata nigra*.

Description. General color black to dark mummy-brown, with the mantle hairs, which are slightly shorter than in *A. p. palliata*, golden "ochraceous"; the back is evenly sprinkled with a varying number of light-tipped hairs, and there is a slight scattering of light-tipped hairs on the tail especially on the under surface; very often they are concentrated at the posterior end. The range of color variation in this subspecies is notably great; the brightest-colored individuals have the head, shoulders, and arms dark "mummy brown" with the bases of the hairs "walnut." The flank hairs, which are golden "ochraceous" with the bases slightly paler, are most numerous posteriorly and hardly extend as far forward as the axillary region. The rump, tail, and lower part of the hind legs are a paler shade of "mummy-brown" than is the anterior part of the body, and the bases of the hairs are brownish "buff." The inner margins of the hind legs are golden "ochraceous" as far down as the knee, while on the outer margin the hairs are darker but with a marked golden tinge at the tips. Hairs with much reduced light bands are plentifully sprinkled over almost all of the back. This extreme form of coloring differs markedly from that found in *A. p. palliata*. The ground color is a much paler, more golden brown, the flank hairs are "ochraceous" rather than "orange rufous," and this bright coloring extends much farther down on the hind limbs. From this extreme there are all degrees of coloring to almost pure black; the brown on the limbs is exceptional rather than usual, most of the specimens being quite black. Even in dark individuals there is usually a sprinkling of light hairs on the under sur-

face of the tail with a marked concentration at the tip. It is noticeable that even where the bright mantle is almost totally absent the back is still more or less profusely sprinkled with hairs banded with buffy "ochraceous" and there is little tendency for these to concentrate posteriorly as in *A. p. palliata*. These two traits are particularly important in setting this subspecies apart from *A. p. palliata*. In individuals where the mantle is not very pronounced, it is much less golden and tends toward buffy, which together with its shorter length helps to separate this form quite definitely from *A. p. trabeata*.

Skull. The skulls of this race are so similar to those of *A. p. palliata* that it would be impossible to separate the two forms on the basis of skull characters alone. The rostrum is slightly shorter in proportion to the total length and to the length of the braincase and the proportional width across the zygomatic arches is slightly broader than in *A. p. palliata*; the former character is most noticeable in male skulls. There is a tendency even in young skulls for the lateral ridges to meet in a sagittal crest, and to have a pronounced triangular occipital projection. Otherwise in size, general shape and proportions, their ranges of variation are mutually inclusive. The widely separated extremes in the female's ratios of length of upper cheek teeth to total length in *A. p. aequatorialis* both came from Panama, the lowest from Citrus and the highest from the Canal Zone.

Remarks. The first published description of an Ecuadorean howler monkey was that of Thomas in 1880 who refers his specimen to *Myctes niger*, the black howler of Paraguay, which Elliot in "A Review of the Primates" (1913) considers as synonymous with *Alouatta caraya*. Thomas's specimen came from Intac about 50 miles north of Quito. At the time when he first examined it, the sex of the animal was undeterminable, and in general appearance it seemed to agree quite closely with Humboldt's original description of the female of *Simia caraya*,—head and back black, sides yellow. He further compares the Intac form with *A. p. palliata* and goes on to say that: "*Myctes palliatus*, to which this specimen bears a certain resemblance, is found only in Central America and differs in the length of the hairs and in the detailed distribution of the colours." In 1903 in a detailed account of the four specimens from which he described *A. aequatorialis*, Festa emphasizes their general chocolate-brown color with the bases of the hairs yellowish fulvous, the tips yellow, and the flanks golden yellow. The females, he says, are browner with less golden than the males. Compared with *A. nigra* he says that they differ in being chocolate rather than black. Although Thomas's specimen from Intac is blacker

than his, Festa believes that it should belong to the same species and hence calls his *A. nigra*. He does, however, call attention to the necessity of having more specimens before a final determination can be made and proposes *A. aequatorialis* if it should turn out to be different. In 1913 the Intac specimen was made over and it became obvious that it was a male, so Thomas redescribed it, this time calling it *A. inclamar*, sp. n. "General colour black. Under surface mixed black and buffy, the inconspicuous lateral mantle cream-buff. Hands mixed black and buffy. Thighs black along their antero-external edge only, their hinder and lower sides conspicuously buffy, contrasting strongly with the general black colour. Lower legs blackish all around; feet mixed black and buffy. Tail black for three-fourths its length above, its under surface and terminal fourth whitish buffy." He does not compare it with *A. p. palliata*, but states that the yellowish thighs set it apart from *A. caraya* and *A. villosa*. He distinguishes it from *A. aequatorialis* on the ground that Festa's form was "chocolate brown" rather than "black." In the same paper Thomas describes another howler monkey, *A. p. quichua* from the Rio Blanco 20 miles west of Mindo, Ecuador. This he considers to be a southern form of *A. palliata*. In contrasting this form with the Central American one, he notes: "Posterior back finely ticked with buffy, the hairs commonly black with buffy (ochraceous buffy) tips," and the "tail with many of its hairs buffy, especially towards its tip." Both of these points I have found to be distinctive features of *A. p. aequatorialis*. Comparing the skull of *A. p. quichua* with that of *A. p. palliata* he says that the "mesopterygoid fossa is more squarely open anteriorly and the zygomata are less broadened vertically, especially in their anterior part." These traits I have found to be extremely variable, and the latter particularly is dependent almost entirely on the age of the individual, so that neither of them is really good for purposes of classification. A further difference that he mentions and which does not seem to hold when large series of both animals are studied is that those from Central America are "buffy-sided" whereas the Ecuadorean ones are more "tawny-mantled." More accurately, the difference in coloring of the lateral hairs is that in *A. p. palliata* they have considerably more red pigment and therefore are more "orange rufous" than in *A. p. aequatorialis*. The two forms that Thomas describes come from places that are relatively close together, and as they fall well within the range of variation for *A. p. aequatorialis*, I think that they may undoubtedly be considered as synonymous. The Panama form, *A. p. inconsonans*, which Goldman described in 1913, may also be considered as synony-

mous with *A. p. aequatorialis* although in many ways it seems to be intermediate between this and *A. p. palliata*. Topotypes of Goldman's subspecies from Cerro Azul resemble quite closely the Ecuadorean monkey, their general coloring ranging from all black to black with the back evenly suffused with light-banded hairs; the light mantle, when present, is very limited in extent and may be of almost any shade from "walnut" to brownish "ochraceous." Other specimens from the Rio Chucunaque are almost entirely black with the few scattered mantle hairs in some cases distinctly reddish. Canal Zone specimens, also, are all quite dark with a tendency toward a general scattering of light-banded hairs over the back, the paler mantle hairs are reduced and vary from a preponderance of yellow to one of red pigment. Specimens from all of these localities seem to link the Panamanian animal with the more southerly one, and this division would be quite clear were it not for a few aberrant individuals scattered over this same area. Thus from the Madranal River I have one specimen that is almost as golden as the Herrera howlers with the pigment distributed in a very similar manner, and from the Atrato River in Colombia I have two that are very like those from Costa Rica. Again, a series from the north of Panama around Boquete and Boqueron range from those having a mantle of pale "ochraceous" with the whole back profusely sprinkled with light-banded hairs to others in which the mantle is much more "walnut" and the light-tipped hairs, limited to the lower dorsal region, are much redder at the tips. This series is perhaps the most intermediate of them all. The even diffusion of light-banded hairs over the back in the majority of them, however, leads me to consider them as *A. p. aequatorialis*; yet a single specimen from the coast at the mouth of the river Coto very near this area seems more nearly to approximate *A. p. palliata*. In general the skulls of the Panamanian animals are not as distinct from those of *A. p. palliata* as are the Ecuadorean ones; but this was to be expected considering their intermediate position.

Geographical distribution. This form extends from the southern limit of distribution of *A. p. palliata* in western Panama through the rest of Panama and down along the Pacific coast of South America through Colombia and Ecuador to the region south of the bay of Guayaquil. It is not, however, a strictly coastal form but is found as far inland as the region around Mindo in Ecuador.

Specimens examined. In all, 36, as follows:

Ecuador, Cerro Manglar Alto, near the town of Manglar Alto, three males, skin and skull, four females, skin and skull; Cuaque, river

near Pedernales, one male, skin and skull, one female, skin and skull; El Chiral, Prov. del Oro, one female, skin and skull; Mindo, one male, skin only, two female, one skin and skull, one skull only; Vinces on the R. Vinces which empties into the northern part of the Gulf of Guayaquil, four males, three skin and skull, one skull only, three females, two skin and skull, one skull only; Cerro Bajo Verde, one male, skin and skull, one female, skin and skull;

Colombia, Atrato R., two males, skin only, one female, skull only;

Panama, Tacarcuna, one male, skin and skull; Tapalisa, two male, skin and skull; Cituro, one female, skin and skull; Rio Chucunaque, five males, four skin and skull, one skull only, three females, two skin and skull, one skull only; Cerro Azul, one male, skin and skull, six females, skin and skull, one immature female, skin and skull (topotypes of *inconsonans*); Maxim Ranch (probably the Maxon Ranch on the Rio Trinidad in Bocas del Toro), one male, skull only; Canal Zone, near Gatun Lake, two males, one skin only, one skull only, six females, four skin only, two skull only; Canal Zone, two males, one skin and skull, one skull only, three skin only, sex undetermined; Boquete, three males, two skin and skull, one skull only, seven females, five skin and skull, two skull only, two immature females, skin and skull; Boqueron, one female skin and skull; Bocas del Toro, one male, skull only.

Skull ratios

<i>Male</i>				<i>Range</i>	<i>Average</i>
Greatest length	divided by	palatal length		2.66-3.07	2.82
"	"	"	" length of upper cheek teeth	2.58-2.86	2.69
"	"	"	" length of rostrum	3.15-3.55	3.31
"	"	"	" zygomatic width	1.33-1.50	1.36
"	"	"	" mastoid width	1.91-2.11	1.99
"	"	"	" width outside molars	2.72-3.11	2.92
"	"	"	" width of cranium	2.02-2.37	2.16
<i>Female</i>					
"	"	"	" palatal length	2.71-3.08	2.88
"	"	"	" length of upper cheek teeth	2.32-2.95	2.63
"	"	"	" length of rostrum	3.26-3.72	3.50
"	"	"	" zygomatic width	1.30-1.51	1.43
"	"	"	" mastoid width	1.90-2.09	1.98
"	"	"	" width outside molars	2.63-2.98	2.81
"	"	"	" width of cranium	1.89-2.26	2.04

ALOUATTA PALLIATA TRABEATA subsp. nov.

Type. Adult male, skin and skull, no. 29545 Museum of Comparative Zoölogy, from Capina, Herrera Province, Panama, collected in March, 1933, by Dr. Thomas Barbour.

Description. This subspecies is most readily distinguished by the very golden appearance of the flanks and lower part of the back. The lateral mantle of long, golden, silky hairs extends in a wide fringe from the arm-pit to the groin, in some specimens a few golden hairs are also found on the outer margin of the upper arm. The tips of these mantle hairs are pale golden "ochraceous" while the bases are silvery. There is a large area on the lower flanks where no dark hairs are found; the progressive darkening of the hair toward the mid-dorsal region starts with the bases which change gradually from silver through light to deep "walnut." Toward the mid-dorsal region the golden "ochraceous" tip gradually shifts to a ring immediately below the tip while the actual tip is "walnut." The ring, in turn, becomes narrower and narrower allowing an increasing amount of the walnut base to show and thus giving the back a slightly darker appearance than the flanks. The distribution of brilliant coloring over the back varies somewhat in different specimens; in some cases it is continuous across the whole posterior region, while in others a narrow, dark streak may persist centrally. Its antero-posterior extent is also varied, generally the dark "walnut" hairs of the upper part of the body start across the shoulders and reach in a V-shape not quite halfway down the back. On the lower part of the back, and on the hind legs sometimes as far down as the feet, and sometimes on the upper part only, the hairs are ringed with dark "ferruginous" and that takes a very golden sheen in some lights; this marking is found to a lesser degree on the upper part of the fore limbs. The head, shoulders, upper part of the back, tail, and lower part of the limbs are all deep walnut. In most specimens the sides of the face below the ears are slightly paler than the rest of the head and in a few there are distinct, though small, golden "ochraceous" patches in this area. The ventral surface is sparsely covered with pale "walnut" hairs, and in some specimens on the posterior part of the belly the hair is the same golden "ochraceous" color as it is on the flanks.

Skull. The skull varies only slightly from that of typical *Alouatta palliata palliata*, and the differences are not very definite unless one has a fairly large series from which to work. There is a greater sexual difference in size among these monkeys than there is in others of this

species. This is especially noticeable when one compares total lengths. Skulls of males of *A. p. trabeata* average the same length as those of males of *A. p. palliata*, while those of females of the former are distinctly smaller than females of the latter. A study of the table of measurements will show that a large enough series of females was measured to establish this as a real difference rather than a casual variation of a few aberrant individuals. The palate and rostrum of *A. p. trabeata* are both slightly longer when compared with the total length of the skull, this difference is more noticeable in female than in male skulls. When total length is divided by palatal length, the resultant ratios range in the female from 2.71 through 2.86 with an average of 2.77; total length divided by length of rostrum gives a similar range of 3.25 through 3.45 with an average of 3.34. In male skulls the corresponding ratios are for the former 2.74 through 2.80 with an average of 2.77; and for the latter 3.17 through 3.22 with an average of 3.20. The teeth in this new form are of practically the same size as those of *A. p. palliata*, except the premolars of the males which are wider, more nearly approximating the width of the true molars, a difference especially marked in two of the three specimens measured.

Remarks. The distinction of this subspecies depends principally on the much greater distribution of golden "ochraceous" hair on the flanks and lumbar region, and the general browner color of the rest of the body. As color varies greatly in Central American monkeys, it was particularly important to obtain a large series from Herrera to determine whether this difference in color was really a consistent characteristic. Ten specimens were examined from different parts of this province and only one proved to be less golden than the most extreme forms found in the rest of Central America. On an average they were very much more golden than these others and the number of specimens from other areas that even approximated them in color was very limited; a female from the Madranal River somewhat south of the Canal Zone is every bit as golden as the Herrera ones, but unfortunately I have only one example from this locality, so cannot be quite certain whether this is, as I strongly suspect, an extreme individual. From Boqueron in the north of Panama I have a female that is almost as bright although the pigment is "orange rufous" rather than "ochraceous." A few specimens from Boquete have the bright mantle hairs distributed quite far anteriorly but they do not cover the lower region of the back to nearly as great an extent. From Ecuador, I examined one extremely yellow individual that is very similar to *A. p. trabeata*. The Herrera form may be distinguished from this one by its

general "walnut" rather than the "mummy brown" coloring. The bases of the hairs are darker, the tips redder, and the lateral mantle is longer and more golden anteriorly than is the case in *A. p. aequatorialis*. It is always a somewhat uncertain business to subdivide large mammals that have a potentially wide range. In this case, however, we are dealing with an isolated area of forest cut off from the rest of the range by a wide intervening strip of open country. Breeding with darker stock is thus quite effectively cut off, and the tendency will probably be for the distinctive characteristics of *A. p. trabeata* to become increasingly emphasized.

Geographical distribution. These monkeys are found only on the Azuero Peninsula in Panama. This is an isolated area separated from the range of typical *A. p. aequatorialis* by a wide strip of unforested land, so the ranges of these two forms are quite distinct.

Specimens examined. In all, nineteen specimens as follows:

Panama, Parita, one male, skin and skull, three females, skin and skull, one young skin and skull; near Parita, two males, skin and skull, three females, skin and skull, one immature female, skin and skull; Herrera Prov., one female, skull only, one young skull only; Capina, three males, skin and skull, three females, skin and skull.

				Skull ratios	
<i>Male</i>				Range	Average
Greatest length divided by palatal length				2.74-2.80	2.77
"	"	"	" length of upper cheek teeth	2.58-2.64	2.61
"	"	"	" length of rostrum	3.17-3.22	3.20
"	"	"	" zygomatic width	1.33-1.35	1.34
"	"	"	" mastoid width	1.96-2.06	2.01
"	"	"	" width outside molars	2.91-3.00	2.95
"	"	"	" width of cranium	2.01-2.13	2.09
<i>Female</i>					
"	"	"	" palatal length	2.71-2.86	2.77
"	"	"	" length of upper cheek teeth	2.41-2.58	2.51
"	"	"	" length of rostrum	3.25-3.45	3.34
"	"	"	" zygomatic width	1.39-1.46	1.43
"	"	"	" mastoid width	1.84-2.07	1.99
"	"	"	" width outside molars	2.68-2.90	2.81
"	"	"	" width of cranium	1.92-2.09	2.00

ALOUATTA PALLIATA COIBENSIS Thomas

Alouatta palliata coibensis Thomas, Novitat. Zoöl., 9, 1902, p. 135; Elliot, Publ. Field Columb. Mus., Zoöl. Ser., 4, Pt. 2, 1904, p. 727; Id. Publ. Field Columb. Mus., Zoöl. Ser., 6, 1905, p. 533; Id. Publ. Field Columb. Mus., Zoöl. Ser., 8, 1906, p. 556; Elliot, Mon. Ser. Am. Mus. Nat. Hist., 1, 1912 [1913], p. 233; Goldman, Smiths. Misc. Coll., 69, April 24, 1920, p. 230.

Description. These monkeys are somewhat smaller and duller colored than typical *A. p. palliata*. The upper part of the back, the head, and the fore limbs are of such a dark shade of "seal brown" that in most lights they appear black; toward the lower part of the back this becomes paler, and in most specimens the rump and upper parts of the hind limbs are "walnut" with slightly more reddish tips to the hair. The bases of the hairs over most of the body are "walnut" of varying intensities, palest in the posterior region. The hair of the flanks is quite uniformly "orange rufous" to "cinnamon rufous," the bases are either silver or "walnut" and the tips are dark. These mantle hairs are most concentrated on the flanks immediately anterior to the hind legs, though in some individuals a few scattered hairs may extend as far forward as the armpits; they mix gradually with the dark hair on the back and their relative proportion varies considerably. Characteristically the whole lower dorsal region is dark "cinnamon rufous" to "chestnut," and the very reddish mantle, although it is often very extended, is never as bright as in the mainland form.

Skull. In all its proportions the skull is very similar to that of typical *A. p. palliata*. In actual dimensions, however, it is definitely smaller and lacks prominent ridges; there is no flattening of the cranium immediately back of the orbits; the braincase is more rounded, and the teeth, especially the premolars, are smaller.

Remarks. The notably smaller, lighter, skull with its smoothly rounded braincase and smaller teeth as well as the less brilliant, redder color of this howler are its most distinguishing characteristics. Dr. Ray Carpenter who has spent considerable time in Panama collecting and studying Central American howler monkeys, claims that this difference in size is not very marked, basing his conclusions principally on a comparison of the weights of some of these monkeys. Of the five skulls which I myself have examined, none is as large as those of the mainland form. All of them were fully adult, and three, two males and one female, were old with the teeth well worn and sutures completely closed so that it is quite certain they had attained their maximum growth. Thomas, who described the subspecies working with six

specimens, also notes, particularly, the difference in size. For this reason and because the color, also, is distinct, I am inclined to regard *A. p. coibensis* as a perfectly good race, although I do not think as does Goldman (1920), that the differences are sufficient to warrant its separation as a full species.

Although this form was not described until 1902, as early as 1879 a certain Captain Dow remarks on the presence of an island form off the coast of Veragua. "Mr. Salvin tells me that Captain Dow informed him that he once met with Howling Monkeys on the little island of Hicaron, which lies at the southern extremity of Quibo [Coiba] Island off the coast of Veragua. The species would probably be *Myctes palliatus*" (Alston, 1879).

Geographical distribution. This subspecies is found on Coiba Island, off the Pacific coast of Panama.

Specimens examined. Five males, three skin and skull, two skin only; four females, two skin and skull, two skin only; one skin, sex undetermined; all of them from Coiba Island.

				Skull ratios	
<i>Male</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.79-2.80	2.80
"	"	"	" length of upper cheek teeth	2.49-2.61	2.56
"	"	"	" length of rostrum	3.18-3.39	3.28
"	"	"	" zygomatic width	1.28-1.38	1.33
"	"	"	" mastoid width	1.92-2.10	2.02
"	"	"	" width outside molars	2.70-2.99	2.83
"	"	"	" width of cranium	2.05-2.19	2.12
<i>Female</i>					
"	"	"	" palatal length	2.83-2.92	2.88
"	"	"	" length of upper cheek teeth	2.60-2.75	2.78
"	"	"	" length of rostrum	3.22-3.52	3.37
"	"	"	" zygomatic width	1.38-1.40	1.39
"	"	"	" mastoid width	1.98-1.99	1.99
"	"	"	" width outside molars	2.71-2.75	2.73
"	"	"	" width of cranium	1.94-2.01	1.97

ALOUATTA PALLIATA PIGRA subsp. nov.

Type. Adult male, skin and skull, no. 63510 Museum of Zoölogy, University of Michigan, from Uaxactun, Peten, Guatemala; collected May 4, 1931, by A. Murie.

Description. Externally this subspecies may be distinguished by the larger size and the absence in both sexes of any light markings on the flanks. The males, females and the single young one examined were all coal black. The bases of the hairs are either black or a very deep "seal brown," and owing to the fact that the fur is less dense and shorter on the limbs and tail this paler shade shows through the dark tips of the hair giving a slightly brownish tint to the general color in these areas. The hair is thick and fine and relatively rather long when compared with that of either typical *A. p. palliata* or *A. p. mexicana*.

Skull. The skull is large and massive with very pronounced ridges; the braincase is relatively narrow and flattened with a broad, flat, slightly depressed area centrally immediately posterior to the orbits, forming in old males a marked concavity. The orbital ridges are prominent with a pronounced antero-posterior thickening on the outer margin that is enlarged into an angular projection at the top of the zygoma. The interorbital space is broad and flat, the nasal aperture large with a much longer distance from the tip of the nasals to gnathion than in the rest of the species. This is accompanied by a proportional but not so marked lengthening of the rostrum. As compared with *A. p. palliata*, the average width across the zygomatic arches is slightly narrower in relation to the total length of the skull. Notably these arise less abruptly from the rostrum and slope more gradually to the lambdoid ridges over the auditory meatus. A comparison of the mastoid width and the width across the molars with the total length emphasizes the fact that the skulls of this form are proportionally longer and narrower than those of *A. p. palliata*. In this respect Costa Rican howlers are most similar to *A. p. pigra* with only a small average difference. The relative length of the palate and of the upper cheek teeth is about the same in both forms. The ventral surface of the skull presents numerous quite distinctive characters. The pterygoid is much broader antero-posteriorly, and the distance from the alveolus of the last molar to the concavity of the posterior border of the pterygoid is much greater. The delicate hamular process arises rather far anteriorly on the lateral lamina of the pterygoid. The mastoid projection is much more massive, and extends farther posteriorly.

The sexual difference in skull size in *A. p. pigra* is great. In general

the distinctive features found in the male skulls obtain for the female skulls also, but to a less marked degree. In these the most pronounced characters are the longer and narrower shape of the skull, the tapering of the zygomatic arches, the great length from the tip of the nasals to gnathion, the size and shape of the pterygoids, and the thickening of the orbits. The skulls are not as flat on top and there is no interorbital depression.

Remarks. This subspecies is based on a series of twelve specimens collected in 1931, in Uaxactun, Peten, Guatemala, by A. Murie. Five of the specimens are adult males, three skin and skull, two skull only; six of them are females, three skin and skull, three skull only, (one of them without the lower jaw); one of them is a young one, skin and skull. Coming from the same area it is highly probable that many of them were shot out of the same band, and for this reason some of the characters emphasized may not be found to quite so marked a degree in other individuals of the same form collected in less closely associated areas. The differences, however, are so definite that they unquestionably indicate a separate subspecies; indeed, if it were not for the form found at Mountain Cow which seems to be intermediate between this and typical *A. p. palliata*, one might be justified in calling it a distinct species. This is by no means the first record of a black howling monkey taken in Guatemala. *Myctes villosus* Gray, 1845, has been ascribed to this region, but the origin of the type is so obscure that it is impossible to decide to what form this name should apply. It was based on a single, poorly preserved, young specimen which Gray believed came from Brazil. No cranial characters were given, the principal distinctive features being the "abundance, softness and length of the hair; but unfortunately it is in such bad condition that we cannot be quite certain of the direction of the hair on the forehead, though it appears to be directed forward" (Gray, 1845). This specimen is one of a series of nine new species all described in this same paper and all but one supposed to inhabit "Brazils." Because of the wide range of color variation Gray had thought it advisable "that the various specimens which we have in the British Museum should be accurately described, leaving the consideration of the permanence of the distinctions pointed out to be determined at some future time, or by a person more fortunately placed for such a purpose" (Gray, 1845). The manner in which the hair is directed on the forehead and the length and softness or stiffness of the hairs are the two characters which he considers most important taxonomically, though he does mention some few color variations. Selater in 1872 writes that "Mr.

Salvin has often spoken to me of the Black Howler of Vera Cruz; but it is only recently that I have had an opportunity of examining a skin of this animal obtained by him in that district in May, 1862." I have been unable to locate "Vera Cruz" on any maps of Guatemala, and think that undoubtedly he meant "Vera Paz," especially as he himself later refers to the animal as "Guatemalan," and quotes from Salvin in describing the locality visited as follows: "It (the black howler) is abundant throughout the eastern portion of the republic, but is unknown in the forest clad slopes which stretch towards the Pacific Ocean. In the former region it is found at various altitudes over a wide expanse of country. I have heard its cry on the shores of Lake Yzabal, and all through the denser forests of the valley of the river Polochic. It is very common, from the steep mountain road which lies between the upland village of Perula and S. Miguel-Tucuru, and especially in the wilderness of uninhabited forest which stretches from Telemán to the Lake Yzabal. In the unbroken forest country which occupies the whole of the northern portion of Vera Paz, from Cobán and Cahabón to the confines of Petén, it is also abundant" (Slater, 1872). It becomes clear from the above that all of the country referred to by Salvin lies within the provinces of Vera Paz and Yzabal. Slater first believed this animal to be undescribed, but on comparing it with the type of *Myctes villosus* decided that they were the same, and that Gray's specimen did not come from Brazil. In regard to this he writes: "I think it is probable that there has been a mistake in the locality and that it is identical with the Guatemalan animal." He gives no further evidence to support the theory that an error really was made, and seems to base his conclusion entirely on a similarity between the two specimens. He describes his animal as having "long soft hairs, which below show a rufescent tinge," and "the hair on the face being inclined forwards instead of reversed." Too much importance cannot be given to color as the male of *Alouatta caraya* from Brazil is also black; and Schlegel, in 1876, after examining a larger series from Guatemala, some of them collected in Salvin's own localities, states that the direction of the hair on the forehead is not diagnostic as he has found individuals with both types of hair growth collected in the same place. Nevertheless he, also, accepts Guatemala as the type locality for *M. villosus*. Alston in 1879 recapitulates the work of Slater and of Schlegel, and agrees that Gray's form probably did come from Guatemala though he offers no further evidence. None of this is very conclusive, the type of *villosus* is a young, poorly-preserved specimen; as I have pointed out above, black howlers occur also in

Brazil, and the direction of the hair on the forehead is so variable as not to be diagnostic. Further, even if one should accept Sclater's conclusions as to the correct type locality, there is absolutely no way of determining the exact spot in Guatemala where *M. villosus* was taken and so of identifying it either with *A. p. pigra*, or with *A. p. luctuosa*. For this reason it has seemed advisable to reidentify the howler monkeys of this region and to regard *M. villosus* as indeterminate due to the absence of a type locality and the imperfect condition of the type.

Geographical distribution. Enough specimens of this form have not been taken to admit of any accurate statement on its range. The only ones that I have been able to examine all came from the same place in the northern part of Guatemala. Because of their peculiarly heavy-boned structure, associated, I believe, with the country in which they are found, I should expect this to be the race of the forests of the limestone region of northern Guatemala and Yucatan.

Specimens examined. Guatemala, Peten, Uxactun, five males, three skin and skull, two skull only; six females, three skin and skull, three skull only; one young, skin and skull.

				Skull ratios	
<i>Male</i>				Range	Average
Greatest length divided by palatal length				2.74-3.00	2.87
"	"	"	" length of upper cheek teeth	2.68-2.81	2.75
"	"	"	" length of rostrum	3.00-3.30	3.23
"	"	"	" zygomatic width	1.43-1.55	1.49
"	"	"	" mastoid width	2.03-2.23	2.08
"	"	"	" width outside molars	2.93-3.23	3.07
"	"	"	" width of cranium	2.18-2.44	2.34
<i>Female</i>					
"	"	"	" palatal length	2.79-3.00	2.86
"	"	"	" length of upper cheek teeth	2.72-2.77	2.74
"	"	"	" length of rostrum	3.20-3.42	3.31
"	"	"	" zygomatic width	1.48-1.57	1.53
"	"	"	" mastoid width	1.96-2.09	2.03
"	"	"	" width outside molars	2.72-3.00	2.84
"	"	"	" width of cranium	2.08-2.22	2.16

ALOUATTA PALLIATA LUCTUOSA subsp. nov.

Type. Adult male, skin and skull, no. 24059 Museum of Comparative Zoölogy, from Mountain Cow, Cayo District, British Honduras; collected 12 April 1928, by Oliver L. Austin, Jr.

Description. This is another black form distinguishable externally from *A. p. pigra* by its definitely smaller size. The fur is long, silky and very thick, as in *A. p. pigra*, particularly long immediately behind the shoulders. The ends of the hairs are black giving the animal its general color; the bases, however, are dark "seal brown." In the mid-dorsal line posteriorly, on the shoulders, and especially on the sides of the face these are quite pale, while immediately below the ears they become light "fawn" color.

Skull. The skull is moderately long and not very massive, and is intermediate between that of typical *A. p. palliata* and *A. p. pigra*. The braincase is rather broad and rounded; instead of being depressed back of the orbits it is quite dome-shaped. None of the ridges is unusually pronounced. The interorbital space is broad and flat, and the nasal aperture large with a relatively long distance from the tip of the nasals to gnathion. As in *A. p. pigra* this is accompanied by a proportional lengthening of the rostrum. The width across the zygomatic arches is slightly narrower proportionally to the total length than in *A. p. palliata*; these latter arise less abruptly from the rostrum and slope back very gradually to join the lambdoid ridges over the auditory meatus. The ratio of mastoid width and of width across the braincase to the total length is most nearly like that in *A. p. palliata*. The most distinctive cranial characteristics, however, are to be found on the ventral surface. The pterygoids seem to be very different from those found in any of the other forms: very broad antero-posteriorly with smoothly rounded edges. Their posterior margin descends rather abruptly but without any sharp reëntrant angle, the anterior margin is very long, and slopes gradually. As in *A. p. pigra*, the distance from the alveolus of the last molar to the concavity of the posterior border of the lateral lamina is great, and the hamular process arises rather far anteriorly. The audital bullae are larger and more inflated than in either of the above; when compared with *A. p. pigra* this difference is especially pronounced. In some few cases the bullae of typical *A. p. palliata* are almost as inflated but in no instance are they quite as large and they never extend posteriorly so near to the occipital condyles. The mastoid processes are large and extend much farther posteriorly than in *A. p. palliata*.

Remarks. I have been able to obtain only one specimen from this area, and have hesitated considerably before describing a new subspecies from a single individual, especially in a genus where individual variation is known to be so great. Uaxactun and Mountain Cow are not nearly as widely separated as are some of the northern and southern localities where typical *A. p. palliata* is found. There are no very marked natural barriers between them and the type of country is not very markedly different. The specimen is interesting because it seems to link the otherwise very aberrant form from northern Guatemala with the more typical Central American *A. p. palliata*; and it is only because the skull characters are so definitely intermediate between the two groups that I felt it necessary to describe this as a new form. The black, dense pelage, the shape of the zygomatic arches, the interorbital breadth, the large nasal aperture, the breadth of the pterygoids, and the size of the mastoids all relate it to *A. p. pigra*. On the other hand certain of the features that are most important in separating some of the other subspecies of this genus, particularly the size of the skull and the relative proportion of width of braincase to total length relate it to *A. p. palliata*. The more inflated audital bullae and the smoother margin of the pterygoids also link it with this latter form. The existence of so distinct a form as *A. p. pigra* in a small part of a general region where all the rest of the howler monkeys are so closely allied was very puzzling at first, and so I was particularly interested to be able to link them up so definitely through *A. p. luctuosa* with *A. p. palliata*. The very marked difference of the northern form may be accounted for, I believe, in two ways. A study of the rocks of Central America reveals that in northern Guatemala and the peninsula of Yucatan the rocks are predominantly limestone while in the rest of the area they are very largely volcanic. The large skulls and generally heavier-boned structure of *A. p. pigra* therefore are probably due to a much greater per cent of lime in their food and water. Perpetuation of these and other distinctive cranial characters is probably helped by the tendency of these monkeys not to range very far and to interbreed rather closely within each troop.

Geographical distribution. More specimens are needed before the distribution of this form can be determined. It is probably limited to a fairly small area in British Honduras, and merges gradually with *A. p. pigra* to the west and *A. p. palliata* to the south.

Specimens examined. One, the type, from Cayo District, Mountain Cow, British Honduras.

Skull ratios

Greatest length divided by palatal length	2.83
" " " " length of upper cheek teeth	2.60
" " " " length of rostrum	3.09
" " " " zygomatic width	1.41
" " " " mastoid width	1.94
" " " " width outside molars	2.98
" " " " width of cranium	2.14

ALOUATTA PALLIATA MEXICANA Merriam

Alouatta palliata mexicana Merriam, Proc. Biol. Soc. Washington, **15**, 1902, p. 67; Allen, Bull. Am. Mus. Nat. Hist., **20**, 1904, p. 40; Elliot, Publ. Field Columb. Mus., Zoöl. Ser., **4**, Pt. 2, 1904, p. 727; Id. Publ. Field Columb. Mus., Zoöl. Ser., **6**, 1905, p. 533; Id. Publ. Field Columb. Mus., Zoöl. Ser., **8**, 1906, p. 555; Elliot, Mon. Ser. Am. Mus. Nat. Hist., **1**, 1912 (1913), p. 272.

Type specimen. Adult male, skin and skull, no. 79398 U. S. Nat. Mus., Biological Survey Coll., from Minatitlan, Vera Cruz, Mexico; collected April 23, 1906, by E. W. Nelson and E. A. Goldman.

Description. The similarity in size between these monkeys and *A. p. palliata* as well as the wide range of color variation found in both forms makes a subdivision based on external characters alone almost impossible. There are, however, some few differences in markings which together with certain skull traits make this form quite distinct. Principal among these are the more diffuse distribution of light-banded hairs over the back, and the paler more silvery bases of the hairs on the flank and on parts of the dorsal region. The head, shoulders, limbs, tail, and occasionally a mid-dorsal line are black; sometimes this is replaced on the upper parts of the limbs and tail, and on the shoulders by a very dark "seal brown." In the darker forms the bases of the dark body hairs are "walnut"; in the forms where grizzling extends widely over the back all conditions are found from individuals where the hair is predominantly silver at the base to those with these silver-based hairs very sparsely scattered throughout the "walnut" ones. The grizzled effect is produced by one or two rings of silver or pale "tawny" near the tip of the hair; these vary in width and in exact position. The pale flank hairs extend from the armpits to the groin and mingle rather gradually with the dark fur on the back. A comparison of their distribution with that in *A. p. palliata* shows that in the former they are more evenly scattered over the whole back as far anteriorly as the shoulders and occasionally the neck. There is no

tendency to concentrate posteriorly. In those individuals where the light coloring is restricted, the black hairs form a stripe of varying width along the whole length of the back. In color the flank hairs are generally distinguishable from those of *A. p. palliata* by their much more silvery bases, toward the tips they become golden "tawny," and sometimes at the extreme end, dark "seal brown."

Skull. The skulls of both sexes may be identified principally by their longer, narrower braincases; this gives the skulls the appearance of being smaller than those of *A. p. palliata* though the actual difference is not as great as Merriam's description seems to indicate. There is a proportional narrowing of the rostrum, and a slight but not as marked narrowing of the mastoid width in relation to the total length. The zygomatic arches bow out slightly more than do those in *A. p. palliata* so that the ratios of zygomatic width to total length are more nearly alike in the two forms than are the other width to length ratios. Although the upper tooth row does not seem to be markedly shorter in proportion to total length, the last two molars themselves are on the whole slightly shorter than are those of *A. p. palliata*. There is a slight tendency for the braincase to round upward immediately back of the orbits, and the coronoid process of the lower jaw is somewhat more broadly rounded.

Remarks. Merriam in describing this form states that it is "similar to *A. p. palliata* but much smaller." A comparison of the measurements of this subspecies given by him, and by J. A. Allen (1904) with similar measurements of *A. p. palliata* shows that the range of variation of the former falls well within that of the typical form. This uniformity of external measurements is further borne out by a marked similarity in skull length. The original description of *A. p. mexicana* points to the "narrower and more tapering" rostrum, "the coronoid process more broadly rounded," and the "teeth (especially the last molar) decidedly smaller," which together with the longer, narrower braincase are, obviously, the most important cranial characters of this subspecies. Mention is also made of the zygomata being "less expanded vertically and lacking the hump on upper side posteriorly." A study of a long series of skulls of *A. p. palliata* leads me to believe that in all of its forms both of these traits are products of individual variation and that the former, particularly, is very dependent on the age of the animal. Allen in 1904 points to the fact that the original description of *A. p. mexicana* contains no mention of external characteristics and, comparing them with a series of specimens from Chiriqui, he quite rightly states that they are much duller colored, "the flanks

in the brightest specimens as obscurely colored as in the very palest of the Chiriqui examples, none of them presenting the golden rufous so characteristic of the latter." This proves to be somewhat misleading, however, when we compare *A. p. mexicana* with examples of typical *A. p. palliata* collected in Matagalpa, Nicaragua, and in Talamanca, Costa Rica; here the color is considerably darker than in the Mexican howler, and, as I have shown above, there is also a tendency for the flank hairs to be golden rather than silver.

Certain members of this group are further marked in an odd and rather abnormal manner with yellowish-white bands around the tail and similarly colored markings on the feet. Three of the females, one of the males and a young one were all marked in this way. The extent of these markings varies in the different specimens: on the dorsal surface of the tail the band was never much over an inch and a half wide while on the ventral surface it sometimes extended far along the naked palm. When the feet had white markings, their palms were always spotted with white, while the toes were sometimes completely white, even the nails, but in other cases they were merely ringed with white around the bases. Although this probably has no differential significance, it is interesting that a marked tendency toward this peculiarity seems to be limited to this group and to the howler monkeys on Coiba Island.

Geographical distribution. These monkeys are found principally in the southeastern part of Mexico in the province of Vera Cruz; they probably extend as far south as the edge of the limestone region where *A. p. pigra* is found, and north as far as howler monkeys occur.

Specimens examined. Six from Pasa Nueva, State of Vera Cruz, Mexico, three male and three female, all skin and skull; four from Achotal, Vera Cruz, one male and three female, all skin and skull.

Skull ratios

<i>Male</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.59-2.81	2.70
"	"	"	" length of upper cheek		
			teeth	2.62-2.74	2.68
"	"	"	" length of rostrum	3.15-3.31	3.22
"	"	"	" zygomatic width	1.34-1.39	1.37
"	"	"	" mastoid width	2.04-2.14	2.07
"	"	"	" width outside molars	2.91-3.08	3.00
"	"	"	" width of cranium	2.27-2.37	2.31

<i>Female</i>				<i>Range</i>	<i>Average</i>
Greatest length divided by palatal length				2.68-2.86	2.78
"	"	"	" length of upper cheek		
			teeth	2.64-2.76	2.70
"	"	"	" length of rostrum	3.39-3.50	3.46
"	"	"	" zygomatic width	1.42-1.48	1.46
"	"	"	" mastoid width	2.06-2.17	2.12
"	"	"	" width outside molars	2.81-3.03	2.95
"	"	"	" width of cranium	2.15-2.24	2.18

SUMMARY

Seven subspecies of *Alouatta palliata* have been recognized here, *A. p. palliata*, from Costa Rica, Nicaragua, and Honduras, *A. p. acquatorialis* from Panama and the Pacific coast of South America as far south as Ecuador, *A. p. trabeata* subsp. nov. from the Azuero Peninsula in Panama, *A. p. coibensis* from Coiba Island of the Pacific coast of Panama, *A. p. pigra* subsp. nov. from northern Guatemala, *A. p. luctuosa* subsp. nov. from British Honduras, *A. p. mexicana* from Vera Cruz Province in Mexico. Subspecific variation amongst these monkeys is notably very small and individual variation is relatively great. For this reason groups are separated on the basis of average differences and in most cases extreme individuals may be found in each group that resemble very closely individuals of some other subspecies. This is especially true of *A. p. palliata* and *A. p. acquatorialis*, and in Panama transitional forms are found that are very intermediate between the two. *A. villosus* (Gray) has been discarded owing to the imperfect condition of the type, and the impossibility of determining the type locality. *A. p. inconsonans* (Goldman) proves to be synonymous with *A. p. acquatorialis*.

EXTERNAL MEASUREMENTS

Alouatta palliata palliata

No.	Locality	Total length	Tail	Hind foot	Ear	Sex	Collector
A.M. 24437	Costa Rica, Talamanca	1105	625	150	..	Male	M. A. Carriker, Jr.
" 24436	" "	1125	610	150	..	"	"
" 24438	" "	1105	625	150	..	Female	"
A.M. 29849	Nicaragua, Matagalpa	1170	600	170	..	Male	W. B. Richardson
" 28425	" "	1080	560	120	..	"	"
" 28426	" "	1120	620	130	..	"	"
" 28973	" "	1200	640	140	..	"	"
" 28947	" "	1290	660	140	..	"	"
" 29848	" "	1150	570	140	..	"	"
F.M. 22394	Honduras, San Pedro	1050	580	...	..	"	K. P. Schmidt, L. L. Walters
" 22395	" "	1035	580	...	..	Female	"

Alouatta palliata aequatorialis

F.M. 14223	Panama, Boquete	1255	650	150	30	Male	J. H. Batty
" 14229	" Boqueron	1110	600	135	25	"	"
A.M.	" Boquete or Boqueron	1180	630	150	30	"	"
"	" "	1020	500	140	25	"	"
"	" "	1095	570	135	30	"	"
"	" "	1160	590	140	35	"	"
"	" "	1195	630	155	35	"	"
"	Boquete	1090	560	135	25	Female	"
"	"	1075	560	140	35	"	"
F.M. 14227	"	1130	600	135	30	"	"
" 14225	"	1130	600	135	30	"	"
" 14226	"	1100	610	125	30	"	"

Alouatta palliata acqatorialis

No.	Locality	Total length	Tail	Hind foot	Ear	Sex	Collector
U.S.N.M. 257308	Panama Canal Zone	1117	608	132	31	Female	R. K. Enders
Am. Mus. 66709	Ecuador, Cerro Manglar Alto	1195	630	154	..	Male	G. H. H. Tate
" " 66713	" " "	1080	570	140	..	"	"
" " 66712	" " "	1165	635	150	..	"	"
" " 66711	" " "	1135	618	138	..	Female	"
" " 66710	" " "	1092	590	150	..	"	"
" " 66707	" " "	1087	593	139	..	"	"
" " 66708	" " "	1166	608	145	..	"	"
" " 62831	Ecuador, Cerro Bajo Verde	1160	603	146	..	Male	"
" " 62834	" " "	1120	590	148	..	Female	"
" " 62827	" " Vines	1135	645	136	..	Male	"
" " 62824	" " "	1125	604	133	..	"	"
" " 62830	" " "	1205	590	149	..	"	"
" " 62832	" " "	1105	567	142	..	"	"
" " 62825	" " "	1092	586	136	..	Female	"
" " 62828	" " "	1165	667	142	..	"	"
" " 62833	" " "	1020	661	148	..	"	"
" " 46505	" " El Chiral	1080	590	138	..	"	"
" " 66705	" " Cuaque	1180	619	147	..	"	H. E. Anthony

EXTERNAL MEASUREMENTS

Alouatta palliata nigra

No.	Locality	Total length	Tail	Hind foot	Ear	Sex	Collector
U.M. 63505	Guatemala, Peten, Uaxactun	1260	665	160	40	Male	A. Murie
" 63503	" "	1350	707	165	45	"	"
" 63510	" "	1280	680	156	37	"	"
" 63504	" "	1180	640	142	36	Female	"
" 63506	" "	1170	670	145	35	"	"
" 63511	" "	1170	663	145	37	"	"

Alouatta palliata luctuosa

M.C.Z. 24059	Brit. Honduras, Mountain Cow	1200	600	130	25	Male	O. L. Austin, Jr.
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Alouatta palliata mexicana

A.M.	Mexico, Vera Cruz	1142	585	145	..	Male	E. A. Colburn
"	" "	1140	620	153	..	"	"
"	" "	1212	635	152	..	"	"
"	" "	1115	604	153	..	"	"
"	" "	1189	661	150	..	Female	"
"	" "	1123	630	148	..	"	"
"	" "	1119	605	148	..	"	"
"	" "	1110	620	146	..	"	"
"	" "	1107	618	152	..	"	"
"	" "	1100	625	148	..	"	"

CRANIAL MEASUREMENTS

Alouatta palliata palliata

No.	Male												Locality	Remarks	
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar			Width of 1st premolar
24437 Am. Mus.	119	99.5	93.5	40.5	37.5	82	58	53	39.5	42	48	4.7	6.5	Costa Rica, Talamanca, Cuabre	Lower canines missing. R. zyg. and R. mastoid missing.
24436 "	114.5	96.5	89	41.5	35	82	56.5	51.5 (broken)	37	41	46.5	5.0	6.7	Costa Rica, Talamanca, Cuabre	
5323 M.C.Z.	112	95	90	38.5	33.5	79	55	51	38	41.5	46.5	5.2	6.7	Costa Rica, Talamanca	
5333 "	111	96	90	40	33.5	....	....	....	38.5	41	47	5.0	6.7	"	
14141 U.S.N.M.	115.5	98	90.5	38.5	35	83.5	56.5	53	41	43.5	49.5	5.1	7.0	"	Occiput missing; skull deformed; left zyg. abn.
102086 "	....	....	....	40	32.5	74	56.5	51	35	42.5	48	5.2	6.8	" La Carpintera	
Female															
5331 M.C.Z.	107	89	83	39	31.5	73.5	51.5	49	36	39	44.5	4.6	6.7	Costa Rica, Talamanca	3 molars missing. Left zyg. missing. Right zyg. missing. Back of skull -; 3 molars missing. Both zyg. broken; canine. Alveoli of front incisors broken; zyg. asymmetrical abnorm. flattened.
5325 "	98.5	85	79	32.5	29	69	48.5	46	35	38.5	42.5	4.7	6.6	"	
5324 "	....	89	83	34	31.5	73	54.5	52	37.5	40	44	4.7	6.5	"	
5328 "	106	88.5	83	37	31	....	51.5	50	38	39	44	4.6	6.3	"	
5329 "	109.5	90.5	84.5	38	32	....	54	49.5	36.5	39	44	4.2	6.0	"	
5326 "	....	....	....	37	....	74.5	....	....	....	....	....	....	....	"	
5327 "	102.5	85.5	81.5	35.5	29	70	53	52	36.5	38	43.5	4.8	6.5	"	
14133 U.S.N.M.	104	87.5	81.5	37	28.5	68.5	51	49	35.5	37	42.5	4.7	6.3	"	
24434 Am. Mus.	106	88	81.5	37	30.5	75	55	49.5	35.5	39	44	4.8	6.2	"	
24438 "	105	88	84.5	37.5	31.5	74	51	49	36	39	43.5	4.6	6.2	" Carrita	
18917 F.M.	102	87	82	37	29.5	73	51.5	48.5	37	39	45	4.6	6.5	Costa Rica, Guayabo	

3 molars missing.
 Left zyg. missing.
 Right zyg. missing.
 Back of skull -; 3 molars missing.
 Both zyg. broken; canine-
 Alveoli of front incisors
 broken; zyg. asymmetri-
 cal abnorm. flattened.

Lower canines missing.
 R. zyg. and R. mastoid
 missing.
 Occiput missing; skull de-
 formed; left zyg. abn.

Alouatta palliata palliata

No.	Male													Locality	Remarks
	Grreatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar		
28425 Am. Mus.	103.5	86.5	80	34	27.5	72	56.5	54	38	38.5	46	5.6	6.9	Nicaragua, Savala	Young; upper canine, molar 3, lower c. not fully erupted.
29849 "	117	103	92.5	45	36.5	86.5	59	55	42	42	48	5.0	6.7	" Peña Blanca	Occiput broken; upper and lower c. broken.
28973 "	....	100	93	42.5	35.5	83.5	56	53.5	38	41.5	49	5.0	6.6	" Matagalpa	"
29848 "	112	97	91.5	41	33	85	58	53.5	41	R.43	48	5.5	6.7	" "	"
28426 "	107	92	85	37	31	73	56	53	40	41	48	5.6	6.8	" Savala	Type of A.p. matagalpae Allen; 3 & 3 M., Foramen Mag.
29847 "	114.5	....	93.4	40.5	35	....	....	53	40	44	50	5.1	6.9	" Uluce	Occiput broken; L. zyg. & L. mast. broken.
36906 U.S.N.M.	109	94.5	90	39	33	80.5	56.5	51	39	41	48	....	....	E. Honduras	R. zyg. broken, 3 & 3 molars—upper molars missing.
22394 F.M.	114	97	92	42.5	36	82	54	51	38	43	R.47.5	....	....	Honduras, S. Pedro, near L. Tichamaya	
Female															
22833 U.S.N.M.	98	83.5	76.5	33	27.5	65	48	48	34	37	43	4.5	5.9	E. Honduras	
22834 "	99.5	86	80	36.5	28	71	51	48	36.5	38.5	R.44	4.9	6.3	"	
22395 F.M.	102	86	81	37	29.5	68.5	49	48.5	35	38.5	42	4.7	5.6	San Pedro, Honduras	

Alouatta palliata acqatorialis

No.	Male												Locality	Remarks	
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar			Width of 1st premolar
38105 Am. Mus.	111	99	...	41	34	83.5	59	55	40	43	48	5.1	6.8	Panama, Tapalisa	Occiput broken; palate asymmetrical.
38104 "	...	...	...	37	33	80	55	51	40	41.5	47	4.9	6.3	"	Occiput missing.
38081 "	112.5	98.5	93	39	35	84	57.5	52	40	40.5	46	4.9	6.2	"	
36712 "	111.5	97	91	39	34	83.5	55	53	41	41.5	48	4.7	6.4	Tacarcuna	
240410 U.S.N.M.	114	99	93	41	35	81.5	57	51	39	42	46	4.7	6.3	Maxim Ranch	
240471 "	...	104	98	45.5	...	86.5	59.5	...	40	42.5	48	4.6	6.4	Chucunaque	
240406 "	109	92.5	86	37	33	...	56.5	54	37	40	46	5.2	6.4	"	Upper incisor missing.
257094 "	...	97	91	40.5	...	78	55	50	38	38.5	45	4.7	6.3	"	Occiput missing.
240407 "	107	94.5	89.5	39	32.5	78	55	50	38.5	41.5	47	4.9	6.8	"	Left zyg. missing.
240408 "	...	97	91	...	33	79.5	57.5	54	41	43	48.5	5.4	6.9	"	Rt. zyg.-; rt. mastoid -.
														"	Back of occiput-; palate broken.
171069 Biol. Survey	117	102	95.5	40.5	35.5	83.5	59.5	55.5	40	44	49	5.2	6.3	"	
21507 M.C.Z.	113.5	97.5	93	40	36	84	55	50	39	44	48	4.8	6.6	"	Cerro Azul
19790 "	...	...	92.5	39	36	85	58	56	39.5	45	50	4.8	6.7	"	Canal Zone
														"	
29124 "	114.5	100	93.5	40.5	35	83.5	60	52	38.5	41.5	49	4.7	6.3	"	"
10139 "	123.5	...	101	44	...	...	58.5	52	41.5	45.5	52	4.9	7.2	"	M 3 missing.
														"	Ant. alveolar margin absorbed; condyles broken;
														"	Boquete
														"	l. zyg. missing.
														"	Alveoli of incisors absorbed; m 2 broken.
14223 Field Mus.	112	98	94	40.5	...	85	59	52	40.5	43.5	49	4.9	7.1	"	
														"	
18934 Am. Mus.	115	100	95.5	40.5	34	86	57.5	53	39	42.5	48.5	4.9	6.5	"	
153565 U.S.N.M.	119.5	102.5	99	43	38	85	58.5	52	39.5	44	...	5.0	7.0	"	Bocas del Toro
														"	Lower jaw missing; rt. zyg. broken.

Alouatta palliata aequatorialis

No.	Female													Locality	Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar		
3876 U.S.N.M.	103	88	82	35.5	31.5	65.5	51	49.5	...	...	...	...	...	Panama, Atrato R.	M 3 missing.
38185 Am. Mus.	96.5	83.5	79	34	27	69	52	51	35.5	37	41.5	4.4	5.8	Panama, Cituro	
171063 Biol. Survey	100	86	81	34	28	71.5	50	50	33.5	37.5	41.5	4.5	6.3	Cerro Azul	
171067 "	98	82.5	76.5	34	27	70	48.5	51	35	37.5	42.5	4.8	6.0	"	Molar 3 not erupted. Palate and rostrum broken Upper molars very worn
171064 "	106	90	85	...	...	73.5	54.5	52.5	38	40.5	44.5	4.9	6.5	"	
171071 "	108	90.5	84	37.5	30.5	74.5	54.5	51.5	37.5	37	41.5	4.4	5.9	"	
171070 "	104	90	84	37	30	74	52	48.5	39.5	40	44.5	4.7	6.4	"	Brain case asymmetrical. M 3 missing
171065 "	104.5	90	84	37.5	31.5	73	52	50.5	37	40	44	4.6	6.3	"	
171066 "	104	90.5	84	38	30.5	72	50	50	37	41	46	5.0	6.4	"	
257309 U.S.N.M.	102.5	88	82	34.5	29.5	70	51	48.5	35.5	40	43.5	4.9	6.4	Canal Zone	Brain case asymmetrical. M 3 missing
29050 M.C.Z.	102	87.5	81.5	35	30	69.5	49.5	51	34.5	37.5	41.5	R.4.2	R.6.3	"	
29051 "	107.5	92	86	36	31	71.5	53.5	51.5	37.5	36.5	41.5	...	...	"	
14225 Field Mus.	104	87.5	86	37	29	74	52	51.5	36.5	40.5	45.5	5.0	6.8	Panama, Boquete	Brain case asymmetrical. M 3 missing
14226 "	104	89.5	83.5	36	29.5	73	52	49.5	36.5	40	45.5	4.7	6.5	"	
14227 "	101	88.5	82	36	29.5	78	53.5	53.5	37	40	46	5.0	6.2	"	
10137 M.C.Z.	101	86.5	80.5	35	29.5	74	50	51	37	40	44	4.8	6.5	"	
18933 Am. Mus.	103	87.5	81	36.5	29	73	51.5	50.5	39	40	46	4.9	6.7	"	
14229 Field Mus.	100.5	87.5	81	34	29	71.5	50	50.5	35	38	43.5	4.8	6.4	Boqueron	

M³ missing.Molar³ not erupted.

Palate and rostrum broken

Upper molars very worn

Brain case asymmetrical.

M³ missing

Panama, Atrato R.

Panama, Cituro

Cerro Azul

"

"

"

"

"

"

Canal Zone

"

"

Panama, Boquete

"

"

"

"

Boqueron

Alouatta palliata aquatorialis

No.	Male												Locality	Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar		
62831 Am. Mus.	113.0	98.5	91.0	38.5	32.5	75.5	57.0	54.0	38.0	43.0	48.5	5.5	6.6	Ecuador, Cerro Bajo Verde
66713 "	108.5	96.0	90.5	37.0	30.5	81.0	55.0	52.0	38.0	41.0	48.5	5.3	6.4	" Cerro Manglar
66712 "	114.0	104.0	98.0	41.0	34.0	85.5	58.0	53.5	38.0	42.5	48.0	4.9	6.7	Alto Cerro Manglar
66709 "	115.0	101.0	95.0	40.5	33.0	85.0	56.0	51.0	37.5	41.5	50.0	4.6	6.8	Alto Cerro Manglar
62824 "	113.5	99.5	94.0	42.0	35.0	81.5	56.5	50.5	38.0	43.0	50.0	5.6	6.9	Ecuador, Vinces
62830 "	120.0	102.0	97.0	39.0	35.0	86.5	60.0	53.0	38.5	42.0	47.5	5.4	6.6	" "
62827 "	107.0	95.5	87.0	39.0	31.5	75.5	54.0	48.5	38.0	43.0	48.5	5.5	6.7	" "
66706 "	114.5	102.5	96.0	41.5	34.5	84.5	57.5	53.0	39.0	43.0	49.5	5.1	6.8	" Ceracue
Sex?														
Female														
62834 "	104.0	89.0	82.5	35.0	30.5	71.0	54.0	53.0	36.0	38.5	45.0	...	...	" Cerro Bajo Verde
46505 "	97.0	81.5	76.5	31.5	26.0	67.0	52.0	50.5	33.0	36.5	41.0	4.6	5.9	" El Chiral, Prov. del Aro
66710 "	104.5	90.0	83.5	35.0	29.5	74.5	54.5	52.5	39.0	40.0	46.0	5.3	6.5	Ecuador, Cerro Manglar
66707 "	105.5	92.0	86.0	37.0	30.0	70.0	50.5	49.0	36.0	39.0	44.5	4.9	6.2	Alto Cerro Manglar
66711 "	101.5	88.5	82.0	35.0	28.0	72.0	53.0	51.0	36.5	37.5	43.0	4.8	6.3	Alto Cerro Manglar
66708 "	107.0	91.0	85.0	36.0	29.5	73.0	54.5	50.0	36.5	39.0	45.0	4.9	6.5	Alto Cerro Manglar
62825 "	98.0	84.0	78.0	34.0	28.0	69.0	51.0	49.5	36.0	39.0	44.5	5.2	6.3	Ecuador, Vinces
62828 "	102.0	87.0	82.0	35.0	28.0	75.5	53.5	50.0	37.0	39.0	43.0	5.2	6.3	" "
80499 "	102.0	90.0	84.0	36.0	29.0	69.5	52.0	50.5	35.5	40.0	45.0	4.9	6.6	" "
66705 "	103.0	88.0	83.0	37.0	30.0	73.5	54.0	52.5	38.5	41.5	47.0	5.4	6.8	Ceracue
27325 M.C.Z.	100.0	88.0	84.0	36.0	28.0	70.0	52.0	50.0	37.0	39.5	45.0	4.7	6.4	" Mindo
27326 "	100.5	86.0	80.5	34.0	27.0	72.5	53.0	49.0	37.0	39.5	45.0	4.7	6.4	" "
Palate slightly broken.														

Alouatta palliata trabecata

No.	Male													Locality		Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar			
28736 M.C.Z.	111	98	93	40	34.5	82	54	51	37	42	46.5	4.7	6.5	Panama, Herrera, Parita	Type	
29545 "	111	96	90.5	40.5	35	82	55	52	38	43	48	4.8	7.3	" Capina		
29546 "	112	98	91	40	35	84	57	52.5	38	43	47	4.9	7.5	Panama, Herrera, Capina		
Female																
U.S.N.M.	97.5	84.5	79	35.5	29.5	69	49.5	48.5	34.5	39.5	43	4.8	6.3	Panama, Herrera, Parita	Upper incisors -. Canines not fully erupted.	
28735 M.C.Z.	100	87	81	35	29.5	68.5	49	49	34.5	40	44.5	4.7	6.7	" "		
U.S.N.M.	99	86	81.5	36	30	71.5	51	49.5	35	39	43	4.7	6.2	" "		
"	99.5	86	80.5	35	29.5	69	48	47.5	35	39	43	...	...	" "		
29548 M.C.Z.	99	86.5	81	36	30	71	50.5	49	36.5	41	46	5.0	6.8	" Capina		
29547 "	98	85.5	80	36	29.5	67.5	48	50	34	38	42.5	4.6	6.5	Panama "	Teeth very worn.	
29544 "	95	81.5	77	35	27.5	68.5	51.5	49.5	35.5	38	43	4.5	6.3	Panama, "	"	
27784 "	97.5	84.5	80	35	30	68	47	48.5	35.5	39.5	43	4.6	6.9	Panama, Herrera		

Upper incisors -.
Canines not fully erupted.
Teeth very worn.

Alouatta palliata coibensis

No.	Male													Locality		Remarks
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar			
26887 Am. Mus.	104.5	90	85	37	32	77	51	49	35	40	45.5	4.7	6.5	Panama, Coiba Island	Alv. m. partly absorbed.	
29611 M.C.Z.	103.5	90.5	85	37	30.5	81	54	50.5	36.5	41.5	46	4.8	6.2	" "		
29610 "	105	93	89	38	33	77	50	48	38	40.5	45	4.6	6.3	" "		
Female																
26886 Am. Mus.	95	81	75	32.5	27	68	48	49	35	34.5	42.5	...	...	Panama, Coiba Island	Incisors -; 3 & 3 molars missing.	
26885 "	96.5	82.5	76.5	34	30	70	48.5	48	35	37	41	4.5	5.7	" "		

Alouatta palliata mexicana

No.	Male														Locality	Remarks
	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of braincase	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar	Width of 1st premolar				
13895 F.M.	112.5	95.5	91	40	34	81	52.5	48	36.5	42	48	4.6	6.7	Mex., V.C., Achotal Pasa Nueva	3rd lower molar missing; 1st premolar very worn	
17229 Am. Mus.	112.5	100	94.5	43.5	36	83	54.5	49.5	38.5	41	44	4.8	7.2			
17239 "	112	96.5	92	42.5	35	83.5	55	48.5	36.5	42	47	5.1	6.7			
17232 "	109	93	87.5	39.5	34	78.5	53.5	48	37.5	41.5	46	5.1	6.7			
Female																
17230 Am. Mus.	103	86	80	36	29.5	72.5	50	47.5	35	39	44	4.5	5.7	Mex., V.C., Pasa Nueva		
17235 "	100	83.5	78	36	29.5	69	47	46.5	33	37	41.5	4.3	5.9			
17231 "	103	86	80.5	36	30	69.5	48.5	47.5	34	38.5	44	...	...			
13892 F.M.	102	85.5	80.5	38	30	69	47	45.5	35	37	42.5	4.6	5.6			
13894 "	98.5	82	77	36	28.5	69.5	46.5	45.5	35	37.5	43	4.5	5.9			
13901 "	105	86	80.5	38.5	30	72	50	47.5	35.5	38	43	4.8	6.0	"	"	

Alouatta palliata pigra

No.	Male										Locality		Remarks	
	Greatest length incisors	Condylar-basilar length	Basilar length	Palatal length	Length of rostrum	Zygomatic width	Mastoid width	Width of brain case	Width outside molars	Upper cheek teeth	Lower cheek teeth	Length of 1st premolar		Width of 1st premolar
63503	131.5	122	116	43	43.5	91	64	58	44	46.5	52	5.5	7.5	Guatemala, Peten, Uaxactun " " " " " " " "
63511	"	122.5	107	41	39	79	60	51.5	39.5	44	50	5.3	6.1	
63510	"	126	119	46	42	88	61.5	58	43	45	50	5.5	6.7	
63512	"	126	115.5	42	39	82.5	56.5	52	39	46.5	50.5	5.1	6.6	
63505	"	122	106	42	37	82.5	59	50	38.5	45.5	50.5	5.7	7.0	
Female														
63507	"	104.5	93	37.5	31	68.5	51.5	50	38	38.5	46	5.7	6.4	"
63511	"	105.5	94	37	33	69	51	47.5	36	40	45	5.0	5.9	"
63504	"	106.5	96	35.5	33	67.5	51	48	35.5	38.5	43	4.7	5.9	"
63506	"	106	92	38	31	71.5	54	51	39	40	45	5.5	6.0	"
63508	"	108	96	37.5	32.5	71	53.5	49	38.5	41	46	5.5	6.1	"
63513	"	.....	.....	34	31	64	49	48	37	40	.....	5.2	5.8	No lower jaw. Molars missing.

Alouatta palliata luctuosa

	Male											6.4 Brit. Honduras, Cayo Dist. Mountain Cow
24059 M.C.Z.	114.5	109	101.5	40.5	37	81.5	59	54	38.5	44	49	5.7